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ABSTRACT

A study examined the availability, cost, and usefulness of numeracy packages suitable for use in further education. Sixty-one of 590 further education (including tertiary) colleges in England, Wales, and Scotland (a 10.3 percent response rate) completed survey instruments. Relatively few books and packages were found to be widely used. Many staff members construct their own assignments, and in spite of some apparent duplication of effort, there is some evidence that students preferred college-made assignments over commercial material. It appears that numeracy in further education is an underexploited, underresearched area of study and thus deserving of further research. (The final section of this report includes a few ground rules for developing and using learning packages along with some cautionary notes about computer-based materials. A short appendix on numeracy workshops is also included.) (MN)

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Numeracy Learning Packages for Further Education

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Numeracy Learning Packages for Further Education

A Summary Document

Project Director: Roy Baldwin
South Warwickshire
College of Further
Education

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Principals of FHE Establishments,
Secretaries of Regional and FE
Examining Bodies,
Press and other interested
Institutions/Individuals.

Dear Sir/Madam,

NUMERACY LEARNING PACKAGES FOR FE

Enclosed herewith is a summary of a project directed by Roy Baldwin of South Warwickshire College. The aims of the project were to investigate the availability, cost and usefulness of numeracy packages suitable for use in further education.

Some 61 colleges, and other organisations, were surveyed, by questionnaires, visits and telephone. Surprisingly, although the authors located a number of packages, none appeared to be directly aimed at FE.

This summary highlights the main findings. The survey was modest and the usual difficulties of low response and poor local dissemination were encountered. But the results are interesting: relatively few books and packages are widely used; many staff construct their own assignments, and in spite of some apparent duplication of effort, there is some evidence that students preferred college-made assignments to commercial material.

The final section of this summary includes a few ground rules for developing and using packages, and some cautionary notes about computer-based materials. A short appendix on numeracy workshops gives some useful information.

The general impression is that numeracy in FE is an under-researched, under-exploited and under-resourced area of work. The authors indeed recommend that a national support unit be set up. The full report is available from South Warwickshire College*; it contains more evaluation data and a 'map' of numeracy resources, including computer-based material.

Yours faithfully,

Jack Mansell

JACK MANSELL
Chief Officer

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I. INTRODUCTION AND REVIEW

Background

1. In July 1982, the Project Director attended a DES short course in Mathematics in Further Education at Wolverhampton Polytechnic. A numeracy study group was set up and it examined very closely the questions: What is numeracy? How best can it be delivered? What resources are needed?

2. A major outcome was the setting up of a national numeracy 'clearing house' scheme. After an initial flurry of activity it quickly became apparent that numeracy-related software was very difficult to find.

   The aims of the project which thus developed were:

   i) To investigate the availability and cost of numeracy learning packages suitable for use in further education.

   ii) To evaluate the usefulness of the material considered with reference to a range of vocational and pre-vocational courses and training schemes.

   iii) To create a quick reference-type numeracy 'map' illustrating the utility of the packages considered.

Methodology of study

3. This project was based on a number of interlinking investigations, consisting essentially of obtaining information about what was available from a wide variety of organisations. This was undertaken using a combination of postal work, visits and telephone and by using questionnaires. Because of the constraints of both time and money, most of the evaluation has had to be subjective, rather than being submitted to rigorous analysis.

4. The initial task was to decide on a definition of a 'numeracy learning package'. Although textbooks would not generally be regarded as 'packages', the way that they are used in terms of the extraction of relevant project and assignment material, ideas and inspiration implies that they will be a major numeracy resource for many teachers. In other words, combinations of suitable textbooks and other published material may be viewed as packages. To investigate the availability and cost of material, lists of educational publishers were obtained, including references acquired from the Education Publishers Body and the *The Education Authorities Directory and Annual**.

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*Published by The School Government Publishing Co. Ltd.

5. A request for information was circulated to every further education and tertiary college in England and Wales using a questionnaire. Letters were sent to a sample of firms which were known to run training schemes, requesting information on numeracy within their training areas and enquiring whether packages were available for purchase. Work done at Skill Centres was examined by visits in order to assess the role of MSC in influencing numeracy resources for training. Austin Rover and Industrial Training Boards, including the Engineering Industry Training Board (EITB) and Hotel and Catering Industry Training Board (HCITB), were also contacted. Each local authority in the UK was contacted via the appropriate mathematics adviser. An investigation was instigated into developments in numeracy and computing in more depth in the case of the Inner London Education Authority (ILEA). All GCE, CSE, and regional examination boards in the country were approached by letter, together with BTEC, CGLI and RSA. A number of vocationally specialised boards were also contacted.

6. The influence of MSC through the Further Education Staff College (FESC)/European Social Fund (ESF) Core Skills Work Based Project was looked at in greater depth together with a project on practical mathematics assessment at London University Institute of Education. Also included were developments of resource material at Brunel University in conjunction with CGLI and the work of the Spode Group, led by Professor David Burgess (Exeter University) and relevant work of the Shell Mathematics Centre (Nottingham University). In addition, all Departments of Education in universities, polytechnics and higher education colleges were contacted. Numeracy-related Open Tech materials, the MARIS database and work done by the National Extension College, through its Basic Skills Unit, were scrutinised. Two Regional Curriculum Bases (RCBs), at Wolverhampton Polytechnic (West Midlands) and Garnett College (London), were visited.

Computing investigations

7. Primary sources of information for computer software included the Council for Educational Technology (CET) Information Sheet no. 1. 'Microcomputers in Secondary Education' especially: National Programmes on Microelectronics, and Computer Programs (software) — Sources of Information. Microelectronics Education Programme (MEP) and Scottish Microelectronics Development Programme (SMDP), Regional Information Centres (RIC) in England and Wales and Software Distribution Centres in Scotland provided a useful source of information and further contacts. The 12 MEP Centres offered a useful service to lec-

turers interested in integrating computer software into their numeracy teaching.

8. Visits were made to the RICs for the Capital Region (in London), Merseyside with Cheshire (in Liverpool) and West Midlands (in Birmingham), Microcomputer Users in Secondary Education (MUSE) was another suggested national source of information. Copies of the journal *Educational Computing** published during the last year were examined to identify less well-known suppliers of software. This search produced well over 200 names. RML produce catalogues for primary, secondary and tertiary education. A search through these produced further names bringing the total to over 250.

9. Contacts were sent a request for up-to-date catalogues of software and information. The response, however, was not good: only about 30%. It was regretfully decided that the project would only evaluate software where a version for at least one of the BBC or RML machines existed.

10. Inspection copies of specific items of software for the evaluation stage were requested. This request was accompanied by a declaration that no attempt at copying the material would be undertaken. As publishers of software are concerned about piracy, this has meant that many of them will not provide inspection copies thus reducing the amount of material available for evaluation.

11. Owing to time constraints, evaluation has, in general, had to be undertaken in-house on a subjective basis by the project team. Nevertheless, some packages were put out for external trial and evaluation, including material in the areas of Catering, Caring Services, Clerical and Retail, and Everyday Life (Adult Basic Education).

12. The following questions were asked of the external evaluators:
    1. Did students understand and enjoy the packages?
    2. Did students gain in understanding or competence?
    3. Would the tutor use the material again and with what sort of groups?
    4. Can the tutor suggest any improvements, modifications, or developments?
    5. Do students or tutors prefer individual worksheets, packs of materials or bound books?
    6. Have you any general comments, regarding curricula, organisational resources or staff developments, involving numeracy?

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*Published by Educational Computing Ltd. An EMAP Publication.

Computing evaluation

13. One of the principal aims of the project was to establish whether any suitable numeracy software existed for the FE sector. But at present there is no material specifically produced for this area. The short period of time for the project did not allow the opportunity for extensive and rigorous trials. For these two main reasons it seemed inappropriate to attempt any classification.

14. Each piece of software has been examined and a checklist compiled. The checklist contains the following information:

    — publisher

    — machines for which programs exist

    — aim of the program

    — a brief description of the program

    — intended age range

    — whether it is part of a package

    — how the operating instructions are given

    — whether any necessary preparation is required

    — category or vocation for which considered suitable

15. Despite limitations of time, we hope that the evidence we have unearthed (albeit rather subjectively and unscientifically) will help staff to solve their resource problems. To this end, the full report is concluded in the form of a 'map' of the availability of numeracy resources.

II. RESULTS OF THE SURVEY

Analysis of questionnaires on numeracy resources

16. The total number of returns was 61 out of a circulation of 590 further education (including tertiary) colleges, in England, Wales and Scotland, representing a 10.3% return. However, the sample encompassed a wide variety of small and large colleges from both urban and rural areas. It is, therefore, reasonable to assume that the percentage of replies forms a realistic sample to draw inferences for the population of FE colleges nationally.

Analysis of materials used in colleges

17. Materials used in colleges were as follows:

College using	*Number*	*Percentage (of 61 colleges)*
Non-vocational textbooks	44	72
Vocational textbooks	24	39
Packages	33	54
Numeracy software	21	34
College prepared material	50	82
A numeracy workshop	22	36
Project work	37	61
Integrated numeracy schemes in a vocational area	11	18

18. Follow-up of a small sample of non-returners revealed:

— Several questionnaires did not reach the relevant staff.

— Many colleges do not have a designated numeracy lecturer, or a clearly defined numeracy structure.

— Some staff were too busy to fill in the details.

— A number of colleges have numeracy serviced by part-time staff which for various reasons causes difficulties of communication.

A popularity poll of non-vocational books

19. Many of the books below have been reviewed by the project team and, although the sample is small, it is interesting to note that a relatively small number of books are quite commonly used, interspersed with one-offs.

A tally of named books used by colleges	*No. of colleges*
Maths — The Basic Skills (Llewellyn & Greer)	10
Maths for Life (Lewis)	7
Numbers at Work / Counting On (Gillespie)	6
Foundation Numeracy (Rees and Barr)	6
Maths for Everyday Life (Greer)	5
Everyday Maths (Christon and Newton)	5
Maths in Print Series etc. (Ridgway)	5
Everyday Maths (Lawson)	4
It figures (BBC)	4
Arithmetic Revision and Practice (Bowman)	3
Maths you need (Ferguson)	3

20. Discussions with college staff showed that the amount of use of published resources depends on how well the materials have been marketed to them by publishers. Local authority advisers could play a much greater part than they do to influence resource purchasing by colleges. The findings confirm that there is a lack of readily accessible and available textbooks within a vocational framework.

Numeracy packages commonly used

21. The following packages were used:

Packages used by colleges	*No. of colleges*
Own assignments	15
ALBSU Packs	7
Number in a city (ILEA)	6
Notts Adult Numeracy Pack	3
SRA Computational Skills Kit	3

In-house assignments

22. Many staff are writing their own assignments. It is likely that a large amount of 'reinventing of the wheel' is taking place.

23. A common theme running through much of our discussion with numeracy teachers was the assumption that their material would not be good enough for other users, coupled with an underestimating of their own ability to produce worthwhile material. It invariably happened that when lecturers stated that their packages were not suitable for outside use, a closer inspection revealed that the converse was true.

The value of materials, workshops and projects

24. There is a lack of adult-orientated material available. Textbooks are a valuable resource for ideas and inspiration by curriculum developers. A significant number of colleges are either intending to develop numeracy workshops soon or are looking into the feasibility of doing so. Project work revolved around staff-prepared, rather than bought-in, material. Only a small percentage of colleges are undertaking any integration of this kind. It was evident that integration was occurring in areas where it was specifically demanded by the cross-modular approach of BTEC. For CPVE, much of the expertise in integrating numeracy into the curriculum resides in college Business Studies Departments.

Some quoted sources of information

25. Quoted sources of information for numeracy material mentioned by respondents include the following:

Catalogues
The Grapevine
ALBSU
The Times Educational Supplement
NATFHE Journal
LEA advisers
Visits to colleges
Courses
ILEA FHE Curriculum Development Unit

Thoughts from the wise at summertime conferences!

III. EXTERNAL EVALUATION OF NON-COMPUTING MATERIAL

Methodology of external evaluation

26. From replies received to the initial questionnaire, 26 colleges and one local school were selected to undertake some evaluation. Packs of material in the areas of Clerical and Retail, Catering, Caring Services and Everyday Life / Adult Basic Education were made up.

27. Each of the packs contained a selection of assignments, projects or worksheets covering a variety of different styles and approaches. These were taken from published material, material used in work-based projects or special curriculum initiatives and worksheets produced by colleges and reproduced within the RCB network. Anonymity of source, however, was carefully maintained.

28. Packs were sent out with a questionnaire detailing the methods of trial and a check-sheet of objectives to aid evaluation. The questionnaire contained only six questions of a general but informative nature (see paragraph 12).

Results

29. There was approximately an 80% return of questionnaires. The time of year of the evaluation affected the returns, because many groups had completed their courses and left the colleges. We therefore invited lecturers to make their own subjective judgement on material without trial.

30. Students generally enjoyed the variety of worksheets whereas published material was often thought to be too vague and condensed for students to work with on their own. Most tutors felt that students had gained in competence. A significant number of colleges would use this material again particularly for YTS groups. College-based assignments were particularly popular. Both students and tutors preferred packs and worksheets to bound books and less able students worked best with individual worksheets.

IV. DISCUSSION AND RECOMMENDATIONS

Comments on published material

31. Many books are available for everyday life and adult basic education levels. Publishers' catalogues are the most important sources of information. Because workshops are increasingly popular and important for numeracy students, quality packs of materials (e.g. ALBSU, *Notts Numeracy Pack*, *Number in a City*) will gain in importance. Photocopyable black-lined masters or loose-leaf binder packs are useful and cost-effective.

Integrated vocational material

32. The situation regarding integrated and vocationally relevant material is quite different. The growth of resources in these areas is not matching the rapid changes in curricular requirements. CPVE material is virtually non-existent, except in the areas of Clerical and Retail where the BTEC core modular assignment approach has encouraged the growth of integrated packages.

Improvement in communication of what is available

33. The general view that students and lecturers prefer worksheets and packs for lower ability in numeracy in vocational and non-vocational areas needs noting by publishers and resource designers. Many commented on the lack of both relevant material and information on how to get it. There is, however, an increasing number of small specialist publishers emerging.

Using packages already designed

34. Colleges are going to have to rely on lecturer-designed material for many future courses. It seems more sensible to explore the availability of packages already designed which need minimal adaptation rather than starting from scratch. The RCBs should play a major role in co-ordination and presentation of college-based material and colleges should make more use of this facility, in both obtaining and contributing resources.

Pre-vocational courses including CPVE and YTS

35. Pre-vocational courses, such as CPVE and YTS, require vocationally relevant and integrated quality packages with much work being done in an assignment task-orientated mode. There is a need for national co-ordination of information on the availability of resources. NERIS (The National Educational Resources Information Service) has started to do this for schools and colleges. ResCue, a new electronic network, provides a database of pre-vocational assignments searchable on-line through The Times Network System.

Role of recent curriculum developers for numeracy

36. Packages produced by the FESC Work Based Projects, Maths in Work, and Open Learning material should improve the quality and quantity of relevant packages material available for use on Numeracy pre-vocational courses. In TVEI, material developed specifically relevant and orientated to numeracy is sparse.

Local authorities and professional bodies

37. In view of the expenditure involved in maths and numeracy education nationally, local authority advisers could be better used in assisting numeracy education in further education. The involvement of The Mathematical Association in running FE maths and numeracy courses and promoting the development of resources and the spread of information is very encouraging. Apart from isolated examples of excellence, there is a disturbing lack of knowledge and interest by Departments of Education in universities and polytechnics.

Summary pointers for course developers in numeracy

38. Course developers should have regard to the following ground rules:

    1. Find out what is available and buy in, rather than 'reinvent the wheel'.
    2. Make much more use of your RCBs and local authority maths advisers.
    3. Keep abreast of relevant school curricular developments in your authority. Join college resource teams and collaborate with other colleges in your area.
    4. Make an effort to find out what is happening outside your authority and what material is being used elsewhere.
    5. Attend courses, pester your regional maths HMI and exploit resource developments linked with MSC.

6. Develop a numeracy workshop both for storage of materials and as a focus for student-centred relevant learning.

Computer Assisted Learning (CAL)

39. In view of the large expenditure needed to develop numeracy software, careful analysis of benefits is required before such investments can be justified. The quality and quantity of hardware resources available to numeracy staff needs to be considered. The production of high quality software poses a real problem, especially in view of the Government decision concerning the future of the MEP programme after the expiry of the initial pump-priming term. It is essential to integrate both teachers and programmers and form material which makes a package rather than an isolated item.

Publishers and computing material

40. The present situation where most software is produced by publishers and small software houses has not resulted in any significant material in the numeracy field and is depressing when one considers vocational numeracy material. Vocational software programs will need greater subsidy than the non-vocational aspects. It is unlikely that commerical publishers would find vocational FE numeracy software an attractive proposition. Some LEAs have taken over the role of previewing software, following the closure of MEP Regional Centres. For example, Birmingham City Council has its own computer centre where staff from the city can view programs.

Examination boards

41. Among the GCE/CSE boards and RAC/Regional Examining Bodies few syllabuses in numeracy relate to specific vocational areas and little development work in resources is taking place.

42. We recommend that consideration is given to setting up a national curricular resource and staff development unit for numeracy and mathematics in FE. Such a unit could overcome many of the deficiencies and communication problems within the FE maths system which at present exist.

APPENDIX: THE INVESTIGATION: POLICIES AND PRACTICE

Numeracy workshops

Numeracy workshops are included in our investigation because the complete ethos of a workshop environment depends on the availability of varied and adequate resources.

The 'workshop' environment has developed to facilitate an individualised learning environment, which involves the acquisition of skills in a contextual framework and personal development. Many numeracy tutors have been led to accept student-centred learning in a workshop environment.

A well-known example at Bradford and Ilkley Community College, set up in 1976, was originally designed to give remedial help, to full- and part-time students but also to deal with the 'drop-in' client from outside. A full description can be found in *The Experience of Open Learning**. Some common characteristics of workshops are as follows.

Environmental characteristics

Sufficient space to allow people to move freely around in a casual, but organised, environment. Posters and learning aids displayed on walls. Learning programmes and schedules of work, either displayed or easily available. Filing cabinets, storage racks and cupboards, suitably arranged to break up the room into discrete areas. Tables rather than desks. Self-study carousels, carpets to deaden sound, together with plants to provide a cheery atmosphere.

Resource characteristics

a. Textbooks and workshops. Worksheets, either produced in-house or purchased outside, clearly indexed and labelled. Diagnostic tests, record sheets and student folders. Answer sheets and mark blocks. Computer software, either purchased or teacher-produced.

b. Games and puzzles of a numeracy nature, intended to help students of all ages to consolidate basic skills.

c. Equipment including aids to measurement and counting. This can be of a general nature or specifically tailored to vocational areas. For

**The Experience of Open Learning* — Bagley W.K. and Challis R.E. FEU/Longman, 1985.

example, micrometers, vernier gauges for Engineering, and thermometers, stopwatches for Caring Services.

d. Microcomputer support together with non-teaching support by way of a technician or librarian.

Using the resources in a workshop

The most important characteristics of a successful workshop are good organisation and committed staff.

Worksheets prepared by numeracy staff may be carefully written to be self-explanatory, but help is required for students who initially lack the self-confidence to help themselves. The teacher must be able to deal with a variety of different problems at almost a moment's notice, and be fully conversant with all that is available, in order to direct students to suitable resources. Students will be working on their own, and some are better at doing this than others. In general, resources must be available to cope with the recurrent process of diagnosis — programme of work — assessment — re-evaluation of programme — reassessment etc.

Keeping good records of work is essential. Workshops with adequate administrative, reprographic and technician support are most likely to succeed. It is necessary to have back-up from support staff who are responsible, for example, for identifying when worksheets are low or when administrative materials are required.

Maximising effectiveness

In general, large colleges investigated showed that they can support more rooms, have more money to buy equipment and material than smaller colleges and can offer a greater staff flexibility. However, individual initiatives within smaller colleges have often effectively overcome these resource problems.

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a) to review and evaluate the range of existing further education curricula and programmes and to identify overlap, duplication, deficiencies and inconsistencies therein;
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c) to carry out studies in further education and to support investigations of and experimentation in, and the development of further education curricula and to contribute to and assist in the evaluation of initiatives in further education;
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